

The Invention

The invention relates to a process for digesting woodchips used in papermaking. The process comprises adding an effective amount of a digester additive to a mixture comprising pulping woodchips and white liquor. The digester additive comprises a sultaine or a mixture of a sultaine and a nonionic surfactant selected from the group consisting of (a) polyoxyalkylene glycols, (b) polyglycosides, and (c) mixtures thereof to a mixture. A sultaine is an amphoteric surfactant, i.e. it has a cationic group and an anionic group. In the case of a sultaine, the positive charge of the cationic group is derived from a nitrogen atom and the negative charge of the anionic group is derived from a sulfur group.

The digester additives are compatible and stable at elevated temperatures in the highly alkaline white liquor used in digestion of woodchips into pulp.

The digester additives are effective in reducing both the Kappa number and percentage of rejects during the cooking of woodchips to pulp. However, unlike most surfactant-based digester additives used commercially, the digester additives are miscible with and effective with highly alkaline white (cooking) liquors having high solids, especially at temperature $>160^{\circ}\text{C}$. The use of the digester additives results in the uniform cooking of the woodchips in the digester, improved yield of woodpulp and a decrease in % rejects, and a lack of deposits on the digesting equipment that is commonly associated with the use of anthraquinone.

Amendments to the Specification

The amendments to the specification were made to correct obvious errors and to make the examples of the specification consistent with the amended claims.

DISCUSSION OF EXAMINER'S OFFICE ACTION

Claim Rejections - 35 USC § 103 (a)

The following is a quotation of 35 U.S.C. §103(a), which forms the basis for all obviousness rejections Office action:

A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Legal Standard of Obviousness

Graham V. John Deere, 383 U.S. 1, 148 U.S.P.Q. 459 (1966) outlined the approach that must be taken when determining whether an invention is obvious. In *Graham*, the Court stated that a patent may not be obtained if the subject matter would have been obvious at the time the invention was made to a person having ordinary skill in the art, but emphasized that nonobviousness must be determined in the light of inquiry, not quality. Approached in this light, §103 permits, when followed realistically, a more practical test of patentability. In accordance with *Graham*, three inquiries must be made in determining whether an invention is obvious:

- (1) The scope and content of the prior art are to be determined.
- (2) The differences between the prior art and the claims at issue are to be ascertained.
- (3) The level of ordinary skill in the pertinent art resolved.

Against this background, the obviousness or nonobviousness of the subject matter is determined. Secondary considerations, such as commercial success, long felt but unsolved needs, failure of others, etc., can be utilized to give light to the circumstances surrounding the origin of the subject matter sought to be patented.

In conjunction with the interpreting 35 U.S.C. §103 under *Graham*, the initial burden is on the Examiner to provide some suggestion of the desirability of doing what the inventor did, i.e. the Examiner must establish a *prima facie* case of obviousness. To support the conclusion that the claimed invention is directed to obvious subject matter, either the references must expressly or impliedly suggest the claimed invention, or the Examiner must present a convincing line of reasoning as to why the artisan would have found the claimed invention to have been obvious in light of the teachings of the references.

To establish a *prima facie* case of obviousness, three basic criteria must be met:

1. There must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings.
2. There must be a reasonable expectation of success.
3. The prior art reference (or references when combined) must teach or suggest all the claim limitations.

The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art and not based on Applicants' disclosure. *In re Vaeck*, 947 F2d 488,

20 U.S.P.Q. 2d 1438 (Fed. Cir. 1991). See MPEP § 2143 - § 2143.03 for decisions pertinent to each of these criteria.

The discussion in *In re Kotzab*, 55 U.S.P.Q. 2d 1313 (Fed. Cir. 2000) at page 1317 is also relevant wherein the Court stated:

A critical step in analyzing the patentability of claims pursuant to section 103(a) is casting the mind back to the time of invention, to consider the thinking of one of ordinary skill in the art, guided only by the prior art references and the then-accepted wisdom in the field. See *Dembiczak*, 175 F.3d at 999, 50 USPQ2d at 1617. Close adherence to this methodology is especially important in cases where the very ease with which the invention can be understood may prompt one "to fall victim to the insidious effect of a hindsight syndrome wherein that which only the invention taught is used against its teacher."³ *Id.* (quoting *W.L. Gore & Assocs., Inc. v Garlock, Inc.*, 721 F.2d 1540, 1553, 220 USPQ 303,313 (Fed. Cir. 1983).

Most if not all inventions arise from a combination of old elements. See *In re Roufflet*, 149 F.3d 1350, 1357, 47 USPQ2d 1453, 1457 (Fed. Cir. 1998). Thus, every element of a claimed invention may often be found in the prior art. See *id.* However, identification in the prior art of each individual part claimed is insufficient to defeat patentability of the whole claimed invention. See *id.* Rather, to establish obviousness based on a combination of the elements disclosed in the prior art, there must be some motivation, suggestion or teaching of the desirability of making the specific combination that was made by the APP. See *In re Dance*, 160 F.3d 1339, 1343, 48 USPQ2d 1635, 1637 (Fed. Cir. 1998); *In re Gordon*, 733 F.2d 900,902, 221 USPQ 1125, 1127 (Fed. Cir. 1984). Even when obviousness is based on a single prior art reference, there must be a showing of a suggestion or motivation to modify the teachings of that reference. See *B.F. Goodrich Co. v. Aircraft Breaking Sys. Corp.*, 72 F.3d 1577, 1582, 37 U.S.P.Q. 2d 1314, 1318 (Fed. Cir. 1996).

The motivation, suggestion or teaching may come explicitly from statements in the prior art, the knowledge of one of ordinary skill in the art, or, in some cases the nature of the problem to be solved. See *Dembiczak*, 175 F.3d at 999, 50 USPQ2d at 1617. In addition, the teaching, motivation, or suggestion may be implicit from the prior art as a whole, rather than expressly stated in the references. See *WMS Gaming, Inc. v. International Game Tech*, 184 Fed 1339, 1355, 51 U.S.P.Q. 2d 1385, 1397 (Fed. Cir. 1999). The test for an implicit showing is what the combined teachings, knowledge of one of ordinary skill in the art, and the nature of the problem to be solved as a whole would have suggested to those of ordinary skill in the art. See *In re Keller*, 642 F.2d 413,425, 208 USPQ 871, 881 (CCPA 1981) (and cases cited therein). Whether the Board relies on an express or an implicit showing, it must provide particular findings related thereto. See *Dembiczak*, 175 Fed at 999, 50 USPQ2d at 1617. Broad conclusory statements standing alone are not "evidence". *Id.*

The person of ordinary skill in the art (TPOSA)

Determining the level of ordinary skill in the art is often the most difficult of the *Graham* inquiry in an *ex parte* proceeding. In an *ex parte* proceeding, the Examiner and Applicants typically do not have

testimony or survey evidence on this issue. They must rely on the experience of the Examiner and Applicants to resolve this issue.

For this invention, Applicants submit that the relevant art relates to papermaking and/or pulping aids. It is assumed that TPOSA working in this field typically had a degree in chemistry or at least a working knowledge of the basic chemistry in the papermaking and/or pulping aids. Applicants assume that TPOSA was aware of the references cited by the Examiner.

Applicants believe these are the circumstances that were influencing TPOSA at the time Applicants made their invention. This information, practical knowledge, and costs influenced TPOSA in solving problems. The papermaking industry was a mature industry and the field was very crowded. Based upon their experience in the art, Applicants submit that technological improvements in this field were gradual and only incremental.

Claims are rejected under 35 U.S.C. 103(a) as being unpatentable over GB 2 155966 in view of ZEMAN (4,913,841).

GB 2 155 966 teaches digesting wood chips used in papermaking by adding an amphoteric surfactant to the pulping liquor to aid the penetration of the chemicals into the wood chips and dissolution of the lignin in shorter periods of time (page 1, lines 28-32). ZEMAN teaches that sulfo-betaine (sultaine) can be used as an amphoteric surfactant (column 1, lines 49- 59) in paper pulping. It would have been prima facie obvious to use the amphoteric surfactant (sultaine) of ZEMAN as the amphoteric surfactant of GB 2 155966, as GB 2 155966 teaches amphoteric surfactants increase the penetration into the wood chips of the cooking chemicals.

Applicants' response

Applicants submit that GB 2 155 966 is a generic teaching, which does not suggest their process. GB 2 155 966 teaches that the wood pulping process, the so-called Kraft process, can be improved if a surfactant is added to the wood chips being digested. See page 1, lines 24-27. The preferred surfactants are amphoteric surfactants, which are represented by structures I and II at page 1 of the specification. Neither of these structures include sultaines, and sultaines are not disclosed or suggested elsewhere in GB 2 155 966. Structures I and II are not sultaines, because the anionic group (Q) of the surfactant is derived from a carboxylic acid, not a sulfur containing compound. See page 2, lines 14-18 of the specification of GB 2 155 966.

Furthermore, GB 2 155 966 is a generic teaching with respect to what it teaches about combining the amphoteric surfactant with other surfactants. It suggests that virtually any surfactant can be combined with the amphoteric surfactant, e.g. nonionic, fluorinated surfactants, etc. See page 2, lines 48-52.

GB 2 155 966 clearly does not teach or suggest combining a sultaine with a nonionic surfactant or a glycoside.

The question that must be resolved is whether Zeman, in combination with GB 2 155966, suggests Applicants' process. Zeman does disclose sulfobetaines, but Zeman only makes a generic disclosure regarding how the sulfobetaines are used and does not suggest that they be combined with a nonionic surfactant or a polyglycoside to digest woodchips dispersed in a solution of white liquor. The only disclosure Zeman makes regarding the use of the sulfobetaines is found at column 3, lines 15-24:

The aqueous basic solutions of sulfobetaines of the present invention find use in a variety of applications. Such applications include, for example, bottle washing compounds, hot vat cleaning compounds, paper pulping, paint strippers, railroad and aircraft cleaners, dairy and food plant cleaners, detergent sanitizers, polymer- based wax strippers, and the like. The excellent stability, surfactancy, and low foaming characteristics of the alkyl dimethyl sulfobetaine caustic solutions make them useful in these and a variety of additional applications.

Applicants submit that the combination of GB 2 155 966 and Zeman does not suggest their invention. GB 2 155 966 does not disclose sultaines as amphoteric surfactants that can be used to digest woodchips. Instead, the amphoteric surfactants disclosed in GB 2 155 966 contain carboxylate anionic groups. Additionally, GB 2 155 966 discloses that the surfactant, which can be used with the carboxylate-containing amphoteric surfactant can be virtually any surfactant, even fluorinated surfactants. Furthermore, Zeman only discloses the use of sultaines in a generic way and does not suggest their use in combination with other surfactants to digest woodchips dispersed in a solution of white liquor.

Claims 2-9 and 13-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over GB 2 155966 in view of ZEMAN as applied to claim 1 above, and further in view of VICTOR et al (5,728,265).

GB 2 155 966 teaches using the amphoteric surfactant in combination with nonionic surfactants (page 2, lines 48-52). VICTOR teaches using alkoxylated alcohols and alkoxylated polyglycosides as nonionic surfactants to enhance the penetration of white liquor into wood chips to liquor to aid the penetration of the chemicals into the wood chips and dissolution of the lignin in the chips during the pulping of wood. It would have been obvious to use the nonionic surfactants of VICTOR as the nonionic surfactant GB 2 155 966 as both GB 2 155 966 and VICTOR use the surfactants for the same purpose of improving the penetration of the liquor into the wood chips. It would have been obvious to use the surfactants in equal amounts, e.g. 50:50.

Applicants' response

GB 2 155966 and Zeman have already been discussed. The question is whether combining Victor with GB 2 155 966 teaches or suggests Applicants' process.

Again, the teachings of Victor are very generic, although the claims are quite specific. According to Victor, a wide variety of surfactants can be used in the digesting process (column 2, lines 54-65):

In the process according to the invention, wood chips, wood shavings, sawdust and the like are contacted with a liquid mixture comprised of white liquor and one or more surfactants which are soluble in white liquor and which are selected from the group consisting of polymethylalkylsiloxanes...; alkoxyated silicones; co- or terpolymers of silicones and alkoxyated polyhydric alcohols; alkoxyated aryl phosphates; alkoxyated branched alkyl phosphates; alkoxyated branched and unbranched alcohols; alkyl polyglycosides and alkoxyated alkyl polyglycosides; alkali metal salts of alkyl aromatic sulfates, sulfosuccinates and a silicone; and mixtures thereof.

No where does Victor mention sultaines. Furthermore, if one concludes that Victor suggests using polyglycosides with sultaines, then Applicants submit that it is just as reasonable to conclude that Victor also suggests using polymethylalkylsiloxanes; alkoxyated silicones; co- or terpolymers of silicones and alkoxyated polyhydric alcohols; alkoxyated aryl phosphates; alkoxyated branched alkyl phosphates; alkoxyated branched and unbranched alcohols; alkoxyated alkyl polyglycosides; alkali metal salts of alkyl aromatic sulfates, sulfosuccinates and a silicone; and mixtures thereof with sultaines, since they are also disclosed by Victor. In view of this Applicants submit that the combination of Victor with GB 2 155 966 and Zeman does not suggest their process.

The claims granted in Victor further suggest that the teachings of Victor are generic. The claims require that the digester liquor contain a polymethylalkylsiloxane. Dependent claim 7 indicates that the digester liquor may also contain a polyglycoside. However, no where does Victor suggest that the digester liquor contain a mixture of a sultaine and polyglycoside.

Claim 10/1, 11/1 and 12/1 are rejected under 35 U.S.C. 103(a) as being unpatentable over GB 2 155 966 in view of ZEMAN as applied to claim 1 above, with or without NADOLSKY.

If the claimed sultaine compositions differ from that of ZEMAN, then the claimed sultaines are taught by NADOLSKY. It would have been obvious to the artisan to use the sultaine of NADOLSKY as the sultaine of

ZEMAN. Claim 10/2-9, 11/2-9 and 12/2-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over GB 2 155 966 in view of ZEMAN and VICTOR as applied to claim 1 above, with or without NADOLSKY. If the claimed sultaine compositions differ from that of ZEMAN, then the claimed sultaines are taught by NADOLSKY. It would have been obvious to the artisan to use the sultaine of NADOLSKY as the sultaine of ZEMAN.

Applicants' response

These claims have been canceled.

CONCLUSION

In view of the differences between Applicants' invention and the prior art, Applicants submit their process is not obvious. Table I, at page 9, of the Applicants' specification, clearly shows the advantage of using the blend of the amphoteric sultaine surfactant and the nonionic or alkyl glycoside.

Table I
Test Result Summary

Example	DIGESTER	% REJECT	% YIELD	KAPPA NUMBER	SOLUBILITY
CONTROL	BLANK	1.44	50.72	45.30	---
COMP A	AQ	0.24	45.52	32.48	INSOLUBLE
COMP B	POG	1.52	49.72	41.60	INSOLUBLE
COMP C	PGS	1.40	50.32	44.60	SOLUBLE
COMP D	Sultaine	0.84	50.68	43.21	SOLUBLE
1	Sultaine/PGS	0.44	50.40	40.58	SOLUBLE
2	Sultaine/POG	0.56	49.80	42.08	SOLUBLE

Table I shows that the blends of sultaine with POG and PSG (Examples 1-2) were the only digester additives that were soluble at room and elevated temperature in white liquor and provided the best overall performance.

Furthermore, Applicants submit that their process could only be derived from the references by the use of "hindsight", i.e. by knowing what Applicants' process was in advance from Applicants' disclosure, and then *ex post facto* reconstructing Applicants' invention from the prior art after a thorough search. The prior art does not lead TPOSA to Applicants' process. Applicants submit

that the comments made by the Court in *AIR-vend, Inc. Throne Industries, Inc.*, 229 USPQ 505 at 515 (District Court, Minnesota, 1985) are appropriate here:

The question of obviousness, as the Court of Appeals for the Federal Circuit has acknowledged, is simple to ask, but difficult to answer... The difficulty in answering this question is due in no small part to the strong temptation to resort to and rely on hindsight in formulating the answer. Hindsight, however, is quite improper when resolving the question obviousness. To use the patent in suit as a guide through the prior art references, combining the right references in the right way to arrive at the result of the claims in the suit is, therefore, also quite improper. Combining the teachings of the prior art to produce the claimed invention absent some teaching, suggestion or incentive supporting this combination cannot establish obviousness.

The Examiner knew, from Applicants' own disclosure, what Applicants' process was when the patentability search was conducted. It is not easy to separate what the Examiner knew from the Applicants disclosure and what the prior art suggests. By the nature of the examination, the Examiner makes his determination of obviousness *ex post facto*. TPOSA does not have the advantage of knowing what the invention is, and must derive the invention from his insight as applied to the prior art. Applicants urge the Examiner to keep this in mind when deciding whether Applicants' process is obvious. Applicants submit that it would take more than ordinary skill by TPOSA to derive Applicants' invention from the prior art at the time the invention was made.

Applicants submit that the application is now in condition for allowance and respectfully request a notice to this effect. If the Examiner believes further explanation of Applicants' position is needed, Applicants' attorney will discuss this matter over the telephone or visit the Examiner personally if this may be useful.

Respectfully submitted,

A handwritten signature in black ink, appearing to read "David L. Hedden". The signature is fluid and cursive, with the first name "David" and last name "Hedden" clearly distinguishable.

David L. Hedden
Attorney for Ashland Inc.
Registration No. 29,388

Ashland Inc.
P.O. Box 2219
Columbus, Ohio 43216

Phone: (614) 790-4265
Fax: (614) 790-4268
e-mail: dlhedden@ashland.com